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interior plateau. In the mountains, at an elevation of over 5000 feet, it sometimes sinks to 11.5° C. The nomads of the steppes never cultivate the soil, are incurably lazy, wear only a piece of skin or simple cloth for clothing, and suffer greatly from phthisis and rheumatism, brought about by the action of the sudden changes of temperature on their undefended bodies. The other maladies most common among the Comalis are ophthalmia, cutaneous affections and scrofula. They have learned from the Arabs the use of a few herbs, but the universal remedies are bleeding and cauterization. Almost every native is tatooed all over with burns and scarifications.

The principal interest of this journey is ethnographic. The oldest human vestiges consist of heaps of shells mixed with bones of fishes and turtles, and strewn with flint implements of various kinds and remains of rude pottery. M. Revoil concludes that these remains must antedate 1700 B. C., and bases this opinion upon the fact that the Egyptian paintings of the tomb of Beikmara and those of the temple of Deir-el-Bahari show the inhabitants of Poum, that is, the Comalis, in the possession of metals. M. Revoil believes these mounds to be the work of the Ichthyophagi and Troglodytes of the old historians; while the more recent mounds of Hais, with their green and blue enameled pottery, are pronounced of the Ptolomean era; and the red pottery, amphoras, glass, etc., especially those found at Olok, seem to be of Roman age. M. Revoil believes that contact with the ancient Egyptians and the Ptolomean Greeks raised the Poum or Comali race to a comparatively high state of culture, which the Arab occupation has effaced.

Their arms are the bow and arrow, the lance, long and short, and the sabre and shield. Their cylindrical quiver greatly resembles that of the Egyptian infantry of the XVIIth dynasty. Spite of their debasement and their conversion to Islamism, their physiognomy, their habits, even their dress recall Egyptian, Greek or Roman more than Arab. The men wear still the *sagum arsinveticum*, while the women are attired in the *degou*, which is fastened at the shoulder, and resembles the *peplum* of the Greeks. At a wedding or a marriage they carry the *dairabad* or censer, in which they consume a resinous gum which gives out an odor like that of Russia leather.

GEOLOGY AND PALÆONTOLOGY.

M. JULES MARCOU ON THE GEOLOGY OF CALIFORNIA.—In a recent issue of the Bulletin of the French Geological Society, M. Marcou reviews the work done by American geologists, and adds thereto conclusions derived from his own observations. The "director of the Geological Survey," sometimes by name, at others by title, is, in this article, subjected to a series of severe castigations. After describing the syenitic granite, the contorted gneiss, schists, argillites, slates, etc., and the contracted areas of mountain limestone and trias, M. Marcou comes to the band of fossiliferous Infra-lias, or Rhetian, which for more than a hundred miles exists in close contact with non-fossiliferous talcose or chloritic schists, quartzites, etc., and often in proximity to the veins of auriferous quartz. Here he capitalizes the words, "The gold is not Jurassic, but of the age of azoic rocks and of the most ancient graywackes." The metalliferous veins are never enclosed in the Rhetian, the close proximity of which to the gold-bearing quartz was the cause of the announcement, "made with much solemnity, that the gold of California was much more recent than had been believed, and that the Sierra Nevada and the greater part of the other sierras of the Great Basin were of the Jurassic epoch." Areas of three or four thousand square leagues have been, continues our author, made to move by longitudinal compression, and to rise high above the sea in order to account for the presence of two or three small tongues of Triassic rocks. After a description of the Lower Lias or Sinemurian of Plumas and Nevada counties, and the Cretaceous to the south and west of Shasta City, he arrives at the Tertiary, commencing with the statement that there is no trace of Tertiary rocks in the Sierra Nevada properly so called. The Chico group, with Randall and Trask, and the Tejon, with Conrad and Heilprin, M. Marcou considers as certainly Eocene, with a fauna that certainly approaches the Suessonian and that of the London basin.

The Miocene, which forms all the groups of mountains between Los Angeles, Point Conception and the neighborhood of Fort Tejon, is one of the best developed formations, and both in its lithology and its fossils is the counterpart of the Miocene or Molasse of Switzerland, so much so, that natives of Switzerland and Swabia, without geological education, have remarked to M. Marcou, "Everything here is like our Molasse. Yet the Geological Survey of Whitney and Gabb says absolutely nothing of this resemblance. The *Flysch* of San Francisquito Pass, the *Nagelflüh* of San Fernando Pass and the *Molasse* of the Sierras Santa Monica and San Fernando escaped their notice." After a few words respecting the Pliocene of the deep valleys and parts of the coast, as shown at Los Angeles and San Diego, and mention of the vertebrate remains of the Rancho de Los Encinos, M. Marcou arrives at the Quaternary, where he again falls foul of Professor Whitney. "According to this savant, there was no Quaternary in California; he has seen nothing but Tertiary. More, he has divided the Quaternary of the Sierra Nevada into three groups which he calls Eocene! Miocene! Pliocene! His Eocene may be doubtful, but he is sure of his Miocene and Pliocene. Naturally, to arrive at this conclusion, he has put aside all lithological, stratigraphical and palæontological characters, just as he had done before for the Eocene of Chico in making it Cretaceous."

M. Marcou then proceeds to make merry over the Calaveras skull, which bore in its encrusting gravel a *Helix mormonum*, and which came from a shaft no one had seen. The existence of Quaternary man in California is not questioned by M. Marcou, the existence of mortars, hammers and other stone implements, together with some axes of obsidian and even some fragments of human bones, give incontestable proof of it, while the numerous remains of Elephas, Mastodon, Rhinoceros, Bos, Equus, Canis, Lama, etc., prove the Quaternary age of these remains.

The reference of this unauthenticated skull to the Tertiary age will, says our critic, "suffice to give an idea of the incorrectness and absolute lack of exactitude in observation of this economical geologist or specialist of mining statistics." "As for Tertiary man, there is absolutely no trace of him in all California, at least up to date."

M. Marcou has not yet finished. The glaciers of California are his next theme, and he laughs at the director and sub-director of the Geological Survey of California for marching for hours over the glaciers of Mt. Shasta without ever dreaming they were on a glacier, and at Professor Le Conte for bringing the northern ice-sheet over California.

The mountain ranges of California, according to M. Marcou, belong to the following ages:

I. Sierra Nevada, Tehachape and Sierra Madre (the mountains south of the union of the Coast range and Sierra) to the Azoic.

II. The Coast range, as far south as Point Conception and Santa Barbara, to the Eocene.

III. The Sierras of San Fernando and Santa Monica, to the Miocene.

IV. The hills of Los Angeles, to the end of the Pliocene.

V. The mountains east of the entrance of Cajon Pass, to the end of the Quaternary.

VI. The volcanic eruptions, to the commencement of the present age.

THE CRANIUM OF IGUANODON.—M. Dollo, in a fourth note on the dinosaurs of Bernissart (Bull. du Musée Royal d'Hist. Nat. de Belg., 1883), describes and figures the head of *Iguanodon bernissartensis.* Attached to the front of the mandible is a toothless unpaired bone which M. Dollo names the presymphysial, from its position anterior to the mandibular symphysis. This bone appears to have been observed by Hulke in Hypsilophodon, since that palæontologist mentions a "thin triangular bone bent into a trough-like form" and lying in front of a mandible of the latter saurian. Hulke suggests that this bone may be connected with the premaxilla, but M. Dollo states that in the seven skulls of *I. bernissartensis* studied by him, it was attached to the lower jaw, and that its presence in the upper jaw would render inexplicable the relations of the facial bones to each other. Moreover the anterior angle of the presymphysial bone bears some crests or denticles of bone, which, had the bone been by any means forced away from a previous union with the premaxillary, must certainly have been broken off.

The coronoid process consists, in the order of their importance, of the dentary externally, the coronoid internally, and a vertical process of the articular posteriorly. It thus differs widely from that of the chelonians and lizards of the present age, in which it is formed of the coronoid element only, and from that of the ophidians, which is largely composed of the surangular, but approaches more nearly that of Hatteria, in which it is formed of coronoid and dentary. From all existing reptiles it differs in its position externally to the alveolar border and anterior to the end of the dentary series. The premaxillaries do not differ greatly in their structure from those of Hypsilophodon. The frontals do not form any part of the upper orbital border, from which they are separated by two supra-orbitals. These are borne upon the two pre-frontals, which are also thus excluded from the exterior upper border of the orbit. As a whole, the skull presents a far greater number of points of resemblance to Hatteria than to any other living reptile. Each ramus of the mandible bears twenty-one teeth in use, and numerous partially developed rows on the internal face; while each maxillary carries twenty-five fully-formed teeth. The vertebral column has ten cervical, eighteen dorso-lumbar, six sacral and fifty-one caudal vertebræ, eighty-five in all; while the ribs consist of nine cervical and seventeen dorsal pairs, as the atlas and last dorsal are without ribs. In an appendix M. Dollo compares Iguanodon with *Diclonius mirabilis*,[1] and finds that his "presymphysial" bone is identical with the "flat, thin and edentulous" dentary of Professor Cope.

DISCOVERY OF TRACKS IN THE JURA-TRIAS OF COLORADO.—Professor H. W. Parker, of Iowa College, has discovered some fifty animal footprints in the vicinity of Denver.

Of the slabs which he obtained one is about five feet long, and running across it diagonally are nine pairs of tracks, each two and a half inches long, and with a stride of nearly nine inches and a straddle of five inches. The peculiarity in respect to form is, that every track exhibits but one apparent digit, this ends with a claw, and in some of the tracks seems to be three-jointed. The ball of the foot is deeply impressed and round. Another slab gives five pairs of footprints, much larger, and singularly enough, part of each is rounded like the well known hoof-like sea-weeds. No hoofed animals lived then, and the straddle is very small in proportion to the size of the prints. All these are unmistakable tracks, in the judgment of Professor Parker, who, from long residence at Amherst, Mass., has become familiar with the thousands of footprints found in the Connecticut valley, and constituting the feature of the Amherst College museum.

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[1] E. D. Cope, AMER. NAT., July, 1883, p. 774-7.

In 1880, Mr. R. C. Hills, of this city, found a few Triassic tracks on the western slope of the Rocky mountains, and they are now in the museum of Yale College.—*Rocky Mountain News.*

LOCOMOTIVE APPENDAGES OF TRILOBITES.—In the autumn of 1882 the trilobite, *Asaphus megistos* (Fig. 1), was sent me for examination. In the delay of correspondence with palæontologists, fortunately no report was made, for in the spring of 1883, twelve months after finding the first specimen, the same party found the second, which proved to be the matrix of the ventral surface of the first specimen. It was found about one hundred meters from the point where the first was obtained.

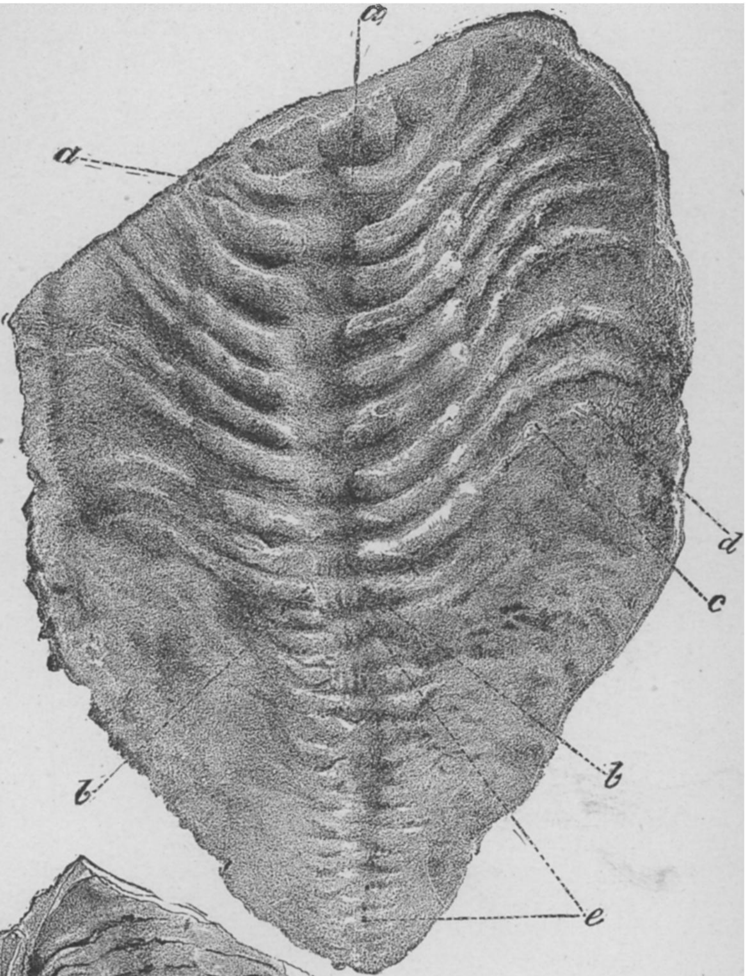
About two-thirds of the cephalic shield is broken off. That part of the head anterior to a line drawn obliquely through the left eye to the middle of the pleura of the second thoracic somite on the right, is entirely wanting. With the head restored, the specimen would be about 18.5 centimeters (7⅜ inches) long; in width, 11.5 centimeters (about 4½ inches). On the ventral surface (Fig. 1) a broad median *groove* extends along the concavity of the thorax and abdomen. It begins at a point beneath the articulation of the head with the thorax, or in the posterior part of the area between the lobes of the hypostoma. Its length is 10.5 centimeters (4⅛ inches)—6.5 centimeters being the length of the thoracic, and four centimeters that of the abdominal portion of the groove. This specimen clearly demonstrates the *concavity* of the three principal divisions of Asaphus, a fact which Mr. Billings pointed out in 1864. The vertical distance from the dorsal surface of the head to a line in the plane of the external margins of the pleuræ is 2.5 centimeters (about one inch).

Directly beneath the eight somites of the thorax, *ten* pairs of jointed limbs are distinctly seen; the two anterior pairs of appendages are situated directly under the first two thoracic segments; but from the character of these appendages, as well as the relation of parts, these, while having the general appearance of organs of locomotion, yet were, no doubt, maxillipedes with the basal joints articulated to the body of the animal, near the point where the oral aperture certainly existed, and presumably they were differentiated to perform the function of mouth organs, and consequently should be considered as belonging to the cephalic division. The remaining eight pairs of legs are then directly referable to the eight thoracic somites. The number of joints in a limb cannot be definitely given from a study of these specimens; the basal joints are not preserved at the median groove.

Following the terminology of Milne-Edwards for the several parts of the limb of a crustacean, the prôminently-marked portion of these ambulatory limbs is undoubtedly the meropodite, which was in some cases two centimeters in length and quite large, with the mero-carpopodite articulation well pronounced, so as to leave a distinct, pit-like depression in the matrix. The several joints externally to that which is considered the meropodite can be distinguished by careful study of the several legs and the grooves and foveæ of the matrix. The carpopodite was about the length of the meropodite, but decidedly slender as compared with the latter. If there was any positive evidence to show that these were broad, lamellar appendages, adapted to swimming, then the slender joints external to the meropodite might be accounted for by supposing the edges were the portions visible. The propodite was about two-thirds the length of the carpopodite, and also appears to have been slender and slightly curved backward; the dactylopodites are not well preserved, yet sufficiently so to permit the conclusion that they were not chelate. The posterior pair of these thoracic appendages is directly beneath the posterior somite of the thorax. The meropodites of the two anterior pairs of appendages, as shown in Fig. 3, resemble the same joints in the thoracic limbs.

In examining the matrix, Fig. 3 *d*, where the left limb of the anterior pair is well preserved, it is seen to curve around the outer margin of the left lobe of the hypostoma, and, from the evidence which the surface presented when first examined, I am of the opinion that this limb was chelate. In removing the limestone so as to expose the left lobe of the hypostoma, and also establish the articulation of the claws, an accidental stroke destroyed the evidence of this direct connection, yet at the fracture the ends of two broken claws can yet be seen. At first I was disinclined to regard the distal extremity of this pair as chelate. Before attempting to remove the limestone, the surface clearly showed a conjunction of these parts. This condition could have been accounted for by supposing one limb to have been thrown over another. It was to clear up this point that the removal of the adhering material was made. If chelate, the claws were slender and of about equal size as in Limulus. As the hypostoma is frequently found in this limestone formation, it is to be hoped that these limbs will also be found, so as to definitely settle this point. On fitting the two specimens together, the ends of these supposed claws are seen at the fracture directly beneath the left eye. These specimens demonstrate that the thoracic appendages were well developed walking legs, extending nearly to the outer margins of the carapace. The exoskeleton of the limbs seems to have been somewhat different in character from the calcareous exoskeleton of the dorsal surface of the animal. At least, it was of such a character as not to preserve well the integrity of the parts in the process of fossilization. They could not have been soft and yielding,

Fig. 1.



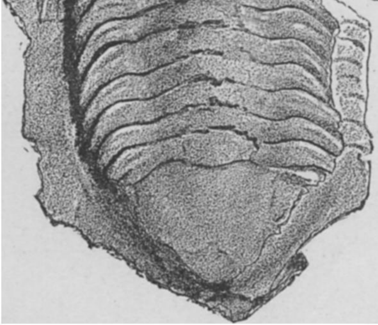
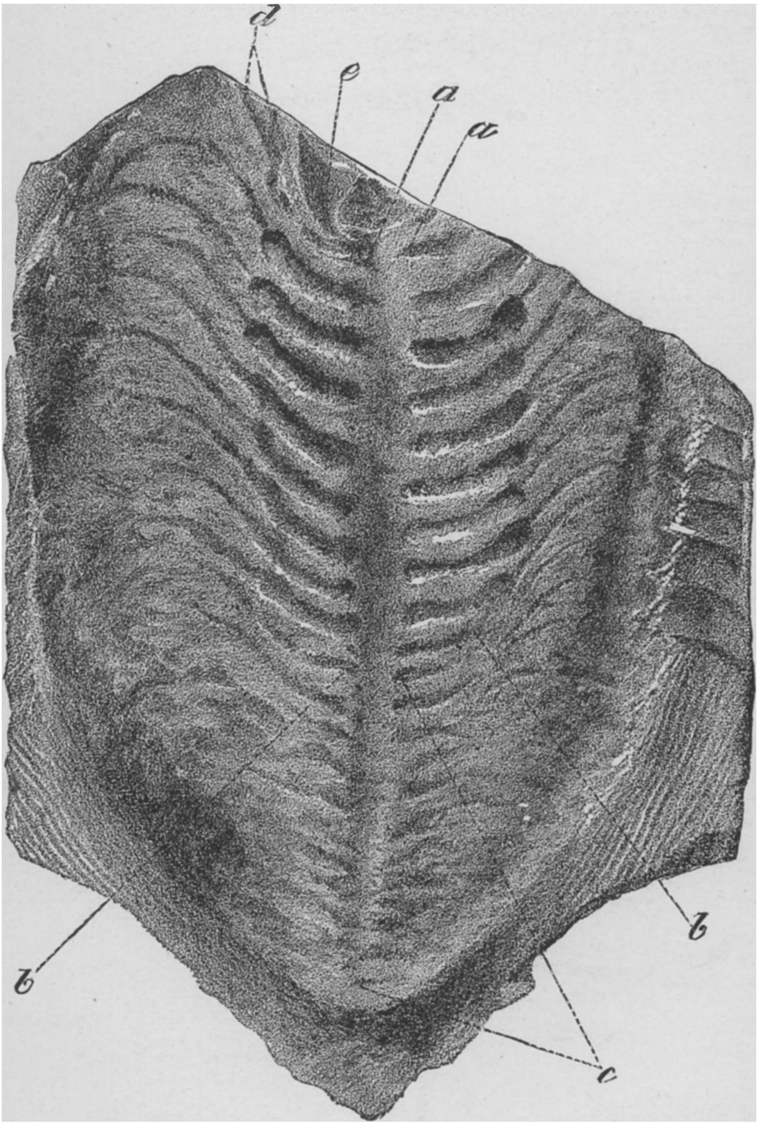


Fig. 2.


d
e
a
a
b
b
c

judging from the symmetry of the matrices of the meropodites, as well as from the general cylindrical character of limbs themselves.

On the ventral surface of the pygidium there are at least twelve (pairs of) appendages; posteriorly, an exact enumeration is impossible. The term *pairs* is used on account of the median groove, showing in the structures a bilobed character. This groove is continuous with the thoracic groove, and is somewhat narrower and more shallow than the latter. From an examination of the two specimens, these twelve or more appendages appear to be leaf-like, or foliaceous, and on each side of the median groove the direction was outward and somewhat forward. No doubt these appendages were branchial in function, and also adapted to swimming.

EXPLANATION OF PLATES XXVI AND XXVII.

FIG. 1.—Natural size. *a a*, meropodites of anterior pair of appendages—maxillipedes; *b b*, eighth pair of (thoracic) legs; *c*, articulation between carpopodite and propodite; *d*, articulation between propodite and dactylopodite; *e*, branchigerous organs beneath pygidium.

FIG. 2.—The specimens 1 and 3 fitted together, and reduced to nearly one-third nat. size.

FIG. 3.—*a a*, matrices of meropodites of anterior pair of appendages; *b b*, matrices of eighth pair of legs; *c*, branchigerous appendages; *d*, left maxillipede, probably chelate; *e*, left lobe of hypostoma.

—*J. Mickleborough, Journ. Cincinnati Soc. Nat. Hist.*

GEOLOGICAL NOTES.—*Triassic and Permian.*—Among new Stegocephali lately described by Herr Credner from the Dyas of Saxony, are *Acanthostoma vorax*, *Melanerpeton spiniceps*, and *Discosaurus permianus*. The last is remarkable for the round disk-like plates, built up of concentric rings, that cover its body.

Cretaceous.—M. L. Dollo (Bull. du Mus. Roy. d'Hist. Nat. Belg.) describes some remains of dinosaurs from the Upper Cretaceous of Belgium. Two vertebræ from the Mæstricht beds may perhaps belong to the form described from the same beds by Professor Seeley. An ungual phalanx from Louzee is evidently that of a carnivorous dinosaur of about half the size of Megalosaurus, and less specialized than that saurian; while two singular teeth having crenulated borders as in Iguanodon, but differing from those of the latter in their antero-lateral compression and other details of form, as well as in the fineness of the serrations, are ascribed to a new genus and species, and named by M. Dollo *Craspedodon louzeensis.*

Tertiary.—In a recent issue of the *Geological Magazine*, Professor Owen gives a basal view of the skull of Thylacoleo, showing clearly the very small size of the space for the cranial cavity and the expansion and strength of the zygomatic arches.